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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,158	10/20/2003	Won-Cheol Jeong	5649-1126	6384
20792	7590	01/04/2005	EXAMINER	
MYERS BIGEL SIBLEY & SAJOVEC			WEISS, HOWARD	
PO BOX 37428			ART UNIT	
RALEIGH, NC 27627			PAPER NUMBER	
			2814	

DATE MAILED: 01/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/689,158

Applicant(s)

JEONG, WON-CHEOL

Examiner

Howard Weiss

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-46 ~~is~~ are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-17 ~~is~~ are allowed.
- 6) ☒ Claim(s) 1-4, 6-10 and 18-46 ~~is~~ are rejected.
- 7) ☒ Claim(s) 5 is/~~are~~ objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1003.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

Attorney's Docket Number: 5649-1126

Filing Date: 10/20/03

Continuing Data: none

Claimed Foreign Priority Date: 12/10/02 (KRX)

Applicant(s): Jeong

Examiner: Howard Weiss

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 18 to 25, 37, 41, 43 to 46 are rejected under 35 U.S.C. 102(e) as being anticipated by Hidaka (U.S. Patent No. 6,754,099).

Hidaka shows all aspects of the instant invention (e.g. Figures 2 and 39 to 43) including:

- an MRAM substrate **SUB**
- a plurality of main cells **MC** each with main magnetic resistors **MTJ** configured to have either a maximum or minimum resistance and access transistors **ATR** connected as claimed
- a plurality of reference cells **DMC** each with reference magnetic resistors configured to have a resistance between the maximum and minimum resistance and access transistors connected as claimed
- common lines **CML**, main bit lines **WBL**, reference bit lines **DBL** and word lines **RWL** all connected as claimed
- a sense amplifier **25,30W**

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:
- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
4. Claims 1 to 3, 6 to 10, 26 to 30, 32 to 36 and 38 to 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hidaka, Li et al. (U.S. Patent No. 6,791,856) and Bhattacharyya et al. (U.S. Patent No. 6,597,049).

Hidaka shows most aspects of the instant invention (Paragraph 2) except for the magnetic resistors, both main and reference, having an elongated shape with a width and length and the reference magnetic resistors extending along the face of the substrate in a nonparallel fashion to the main magnetic resistors. Li et al. teach (e.g. Figure 3) to make main magnetic resistors **100a-e** nonparallel to maximize the magnetic field component along the major axis **122** of the memory cell (Column 4 Lines 3 to 5). It would have been obvious to a person of ordinary skill in the art at the time of invention to make main magnetic resistors nonparallel as taught by Li et al. in the device of Hidaka to maximize the magnetic field component along the major axis of the memory cell.

Bhattacharyya et al. teach (e.g. Figures 5) to make magnetic resistors **20** having an elongated shape with a width **W** and length **L** to provide optimal use of current to switch the data layer of the memory cell (Column 3 Lines 24 to 37). It would have been obvious to a person of ordinary skill in the art at the time of invention to make magnetic resistors having an elongated shape with a width and length as taught by Bhattacharyya et al. in the device of Hidaka to provide optimal use of current to switch the data layer of the memory cell.

5. Claims 4 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hidaka, Li et al. and Bhattacharyya et al., as applied to Claim 1 above, and further in view of Jeong et al. (IEDM 2002).

Hidaka, Li et al. and Bhattacharyya et al. show most aspects of the instant invention (Paragraph 4) except for the structure of each MTJ cell to comprise a pinning layer, pinned layer, tunneling layer and a free layer. Jeong et al. teach (e.g. Figures 7) to make the structure of a MTJ cell to comprise a pinning layer, pinned layer, tunneling layer and a free layer to obtain a high yield (Page 553 First Column). It would have been obvious to a person of ordinary skill in the art at the time of invention to make the structure of a MTJ cell to comprise a pinning layer, pinned layer, tunneling layer and a free layer as taught by Jeong et al. in the device of Hidaka, Li et al. and Bhattacharyya et al. to obtain a high yield.

#### ***Allowable Subject Matter***

6. Claims 11 to 17 are allowed.
7. The following is a statement of reasons for the indication of allowable subject matter: an MRAM device structure as claimed including reference magnetic resistors extending perpendicular to the main magnetic resistors could not be anticipated nor, in combination, be rendered obvious over the prior art of record.
8. Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

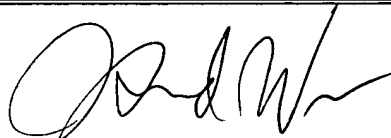
#### ***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jeong et al. (IEEE Magnetics 2004) teach to extend reference magnetic resistors 90° to the main magnetic resistors.

10. Paper copies of cited U.S. patents and U.S. patent application publications will cease to be mailed to applicants with Office actions as of June 2004. Paper copies of foreign patents and non-patent literature will continue to be included with office actions. These cited U.S. patents and patent application publications are available for download via the Office's PAIR. As an alternate source, all U.S. patents and patent application publications are available on the USPTO web site ([www.uspto.gov](http://www.uspto.gov)), from the Office of Public Records and from commercial sources. Applicants are referred to the Electronic Business Center (EBC) at <http://www.uspto.gov/ebc/index.html> or 1-866-217-9197 for information on this policy. Requests to restart a period for response due to a missing U.S. patent or patent application publications will not be granted.
11. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 872-9306**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.
12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(571) 272-1720** and between the hours of 7:00 AM to 3:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via **Howard.Weiss@uspto.gov**.

13. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/422; 365/158	12/28/04
Other Documentation: PLUS Analysis report	12/14/04
Electronic Database(s): EAST, IEL	12/28/04



Howard Weiss  
Primary Patent Examiner  
Art Unit 2814

HW/hw  
29 December 2004